

Methodology and narrative for Estimating Direct and Indirect Adaptation Beneficiaries

1. Introduction and vulnerability context

Fiji is one of the world's most climate-vulnerable countries. More than 75% of the population lives in low-lying coastal areas and depends on coral reefs and mangroves for food, income and coastal protection. Climate change already affects these communities through sea-level rise, more intense cyclones and shifting rainfall patterns. The National Climate Vulnerability Assessment estimates that extreme weather events currently cost Fiji over US\$500 million per year (more than 5% of GDP) and could reach 6.5% of GDP by 2050. Rising seas, storm surges and warming oceans are degrading coral reefs, seagrass meadows and mangroves, threatening the Great Sea Reef (GSR) – the world's third-longest barrier reef and a critical resource for Fijian livelihoods.

The proposed GCF project addresses these vulnerabilities by restoring degraded catchments and coastal ecosystems, enhancing green infrastructure, strengthening management and policy frameworks, and supporting reef-positive enterprises. These interventions are intended to reduce flooding and sedimentation, improve coastal protection, enhance livelihoods and build institutional capacity. Estimating the number of people who will benefit from these adaptation measures is therefore essential for demonstrating impact and aligning with the GCF's Integrated Results Management Framework (IRMF).

2. Definitions and assumptions

The methodology distinguishes **direct** and **indirect** adaptation beneficiaries:

- **Direct adaptation beneficiaries** are individuals who experience an immediate, quantifiable and sustained reduction in climate vulnerability as a result of project investments. They include people living in close proximity to ecosystem-based adaptation (EbA) and green infrastructure interventions, participants in management and capacity-building activities, and those receiving direct financial or technical support (e.g., employees of reef-positive enterprises). Direct beneficiaries are counted once over the ten-year project lifespan.
- **Indirect adaptation beneficiaries** are individuals who do not directly participate in or use project interventions but nonetheless experience positive impacts. These benefits include improved livelihoods, better access to climate-resilient services, enhanced food and water security and reduced exposure to floods or sedimentation. Examples include people living downstream of EbA interventions, customers and suppliers of supported enterprises, and communities benefiting from strengthened institutions and policies. Indirect beneficiaries may overlap with direct beneficiaries and, therefore, are calculated carefully to avoid double-counting.

General assumptions used in the estimation include:

1. **Population data:** Provincial population figures are drawn from national census estimates. Where sex-disaggregated data are not available for a specific output, a gender ratio of 51% men and 49% women is applied, reflecting Fiji's demographic profile.
2. **Buffer distances:** For EbA and green infrastructure, people living **within 3 km** of an intervention are considered direct beneficiaries; those living **3–6 km** from the same intervention are considered indirect beneficiaries. Catchment-level interventions benefit both upstream and downstream communities.

3. **Household size:** An average household size of **5.3** persons is used to extrapolate beneficiaries from the number of employees or participants in enterprise-support activities.
4. **Business participation:** Reef-positive enterprises are assumed to employ **5** people per business. Each enterprise serves approximately **50** customers and engages **5** suppliers, **3** small producers and **3** local vendors. Knowledge spillovers and household multipliers are applied.
5. **Training and management:** Under Output 2.1, management arrangements train **150** participants per province annually. To avoid double counting, annual totals are used rather than cumulative participant numbers.
6. **Avoiding double counting:** Some outputs (e.g., 2.1 and 2.3) share the same beneficiary populations. In such cases, indirect beneficiaries are counted once to prevent inflation of totals.

3. Methodological steps

1. **Identify vulnerability and adaptation needs:** Draw on the climate vulnerability assessment and feasibility study to determine which communities, sectors and ecosystems are most at risk. Fiji's high dependence on coastal ecosystems and the projected increase in climate-related losses underscore the need for interventions that reduce sedimentation, restore mangroves and coral reefs, and strengthen institutions.
2. **Define adaptation benefits by output:** For each project output, specify the adaptation benefit provided (e.g., flood reduction, improved coastal protection, enhanced livelihoods or institutional strengthening) and identify the corresponding IRMF result area. This aligns the project with IRMF adaptation result areas such as:
 - **A1:** Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions.
 - **A3:** Increased resilience of infrastructure and the built environment to climate change. *ARA3.1 - Change in expected losses of economic assets due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention*
 - **A4:** Improved resilience of ecosystems and ecosystem services
3. **Determine the scope of direct beneficiaries:** For physical interventions (Outputs 1.1 and 1.2), overlay intervention locations on population maps to count people living within 3 km of each site. For community capacity-building (Output 1.3) and management training (Output 2.1), multiply the number of communities or training sessions by the average number of participants and household size. For enterprise support (Outputs 3.1), count business owners, employees and their household members. Use sex-disaggregated data where available; otherwise apply the demographic ratio.
4. **Estimate indirect beneficiaries:** For EbA and green infrastructure, count people living 3–6 km downstream who will benefit from reduced flooding and sedimentation. For management outputs (2.1 and 2.3), the entire population of the four target provinces is considered indirect beneficiaries because stronger governance and management of the GSR improve coastal ecosystem services for all residents. For enterprise support outputs, estimate indirect beneficiaries by applying multipliers to customers, suppliers, small producers and community members. Use the gender ratio to disaggregate when necessary.

5. **Aggregate beneficiaries and avoid double counting:** Summarize direct and indirect beneficiaries by output, ensuring that individuals counted under one output are not counted again under another. For example, Outputs 2.1 and 2.3 share the same indirect beneficiaries (provincial populations), so only one figure is used. Outputs 1.3 and 2.1 also overlap; indirect beneficiaries for Output 1.3 are therefore not reported separately. Aggregation across outputs produces the total project beneficiaries: **121,358** direct beneficiaries (61,893 men and 59,465 women) and **215,708** indirect beneficiaries (110,011 men and 105,697 women).
6. **Sex-disaggregated reporting:** Present beneficiary numbers separately for men and women in both the narrative and the Excel sheet. Where data are not available, apply the demographic ratio. This ensures compliance with the IRMF requirement to disaggregate beneficiaries by sex.

4. Adaptation beneficiaries and IRMF result areas

Table 1 summarizes the scale of interventions. This is followed by table 2 which estimates direct and indirect beneficiaries for each output, disaggregated by sex and linked to the relevant IRMF result areas. Totals are calculated after adjusting for overlaps to avoid double counting.

The project delivers nine outputs across three components. Three (Outputs 1.1, 1.2, 1.3) are place-based, on-the-ground interventions; three (2.1, 2.2, 2.3) build governance, evidence and policy capacity; and three (3.1, 3.2) strengthen the market for reef-positive enterprises. Their beneficiary calculation method differs by type with buffer-based for the physical interventions, participation-based for governance and community outputs, and multiplier-based for enterprise outputs.

Table 1. Intervention type and scale

Output / Activity	Intervention type	What it physically involves	Scale
1.1.1 Mangrove restoration	Ecosystem-based adaptation (EbA)	Replanting and natural regeneration of degraded mangrove stands along the coastline of Ba, Ra and Macuata provinces, stabilising shorelines, providing storm-surge buffering, and trapping sediment before it reaches the reef.	835 ha across 3 provinces
1.1.2 Riparian buffer restoration	Ecosystem-based adaptation (EbA)	Replanting native vegetation in 100–500 m buffer strips along riverbanks and waterways across all four provinces, reducing soil erosion and sediment/nutrient runoff into the GSR, and reducing peak flood flows.	2,524 ha across 4 provinces
1.2.1 Living shorelines	Green/hybrid infrastructure (NbS)	Construction of nature-based seawalls combining natural materials (rock, sand, vegetation) to attenuate wave energy and reduce storm-surge flooding at sites identified through flood modelling as having the highest risk-reduction value.	12 km across 4 provinces

1.3 Locally Led Adaptation Fund (LLAF)	Community-led grants	Direct grant funding (ceiling USD 150,000/project) to community-based organisations and NGOs for locally designed adaptation projects , small-scale EbA, water security, or livelihood measures identified through community planning.	10 projects, ~4 communities each
2.1 GSR management arrangements	Governance / institutional	Establishment of a GSR Management Unit embedded in the Ministry of Environment and Climate Change; development of a 10-Year R2R Land and Marine Use Management Plan; Fisheries Management Plans (FMPs) for 20 qoliqoli (traditional fishing grounds).	4 provinces, 20 qoliqoli
2.2 Evidence base	Knowledge product	Monitoring, economic valuation, and reporting on the biophysical and economic benefits of EbA and living-shoreline interventions, to inform replication and policy uptake.	National
2.3 Updated procedures	Policy / planning	Revisions to the National Adaptation Plan, National Biodiversity Strategy and Action Plan, and four Provincial Adaptation Plans to formally integrate EbA, living shorelines and R2R planning.	National + 4 provinces
3.1 Business development support	Enterprise / financial	Technical assistance and capacity-building to BDS providers, who in turn support 50 reef-positive enterprises (ecotourism, aquaculture, sustainable fisheries, agriculture) to reach investment readiness.	50 businesses
3.2 Coordination & resources	Enterprise / institutional	Multi-stakeholder working groups, capacity-building sessions and shared tools (assessment frameworks, monitoring systems) connecting enterprises, BDS providers, financial institutions and government.	16 working groups/year

Outputs 1.1 and 1.2 reduce coastal and riverine flooding and sedimentation by restoring natural ecosystem functions (mangroves, riparian vegetation) or building hybrid green infrastructure (living shorelines). The people who benefit from a flood-reduction intervention are the people exposed to flood risk near that intervention. The beneficiary counts are built from a proximity based on the spatial flood model outputs. The Feasibility Study's flood model (Annex 2a, Section 8.1) simulates storm-surge flood extents under future climate conditions, calibrated against Fiji's most severe historical cyclones (Winston, Evan, Yasa). Two thresholds are used:

- **Direct (0–3 km):** 0–3 km from an intervention, approximating the 5 m flood elevation contour with populations here classified as DIRECT beneficiaries as they would be otherwise susceptible to future storm-surge heights of up to 5 m above mean sea level.
- **Indirect (3–6 km):** 3–6 km from an intervention (exclusive of the 0-3km area), approximating the 10 m elevation contour, the population here is classified as INDIRECT beneficiaries,

capturing secondary effects such as reduced disruption to transport, markets, and services that direct beneficiaries rely on.

The methodology is based on GIS analysis of the tropical cyclone and storm surge impacts which is calculated as follows

1. The model is run once for a future baseline without the intervention to identify the locations most severely impact by extreme storm events.
2. Possible intervention are mapped and include the mapped polygon(s) of a mangrove or riparian restoration site, or the point/line location of a living-shoreline segment.
3. The model is run again for a future baseline with the interventions and with the intervention's effect on flood friction/wave attenuation included, and take the difference to identify where the intervention measurably reduces flood height.
4. Create the 3km (direct) and 6km (indirect) buffers around the intervention footprints and overlay the buffers on population data and use spatial statistics to populations in each buffer.

Maps of projects interventions locations and identified beneficiaries are included in **Annex 2a Chapters 6 and 8**.

For non-physical interventions of such Outputs 1.3 (LLAF), 2.1–2.3 (governance/evidence/policy) and 3.1 (enterprise support) with training sessions or a business grant not having a flood-reduction footprint. These outputs instead use participation-based or multiplier-based calculations, set out in Section 4.

Table 2. Beneficiary assessment methodology

Calculation type	Applies to	Direct beneficiary rule	Indirect beneficiary rule
Buffer-based	Outputs 1.1, 1.2	Population within 3 km of the intervention footprint (flood-model-derived, $\approx$ 5 m elevation contour)	Population 3–6 km away ($\approx$ 10 m elevation contour)
Participation-based	Outputs 1.3, 2.1, 2.2	Explicit headcount formula (projects $\times$ communities $\times$ size; trainees $\times$ provinces; institutions reached)	Province-wide population (2.1) or not separately counted, to avoid double counting with 2.1 (1.3, 2.2)
Enterprise-multiplier	Outputs 3.1, 3.2, 3.3	Business owners + employees + employee households, using documented per-business multipliers	Customers, suppliers, producers and vendors connected to supported businesses, using the same multipliers

Activity 1.1.1 restores 835 ha of mangroves across three provinces. The flood model identifies 42,157 people living within 3 km of the validated restoration polygons (direct) and 93,617 people living 3–6 km away (indirect), summed across Ba, Ra and Macuata. The same process applied to **Activity 1.1.2** (riparian buffer restoration, 2,524 ha across all four provinces) yields 68,709

direct and 273,229 indirect beneficiaries. There is however an overlap between these populations with some people benefiting from both interventions. The buffer zones from interventions Outputs 1.1 and 1.2 are dissolved into single direct and single indirect buffer areas. **The population counts are derived from these dissolved buffers and come to 774 97 direct and 128 958 indirect people.**

Additional beneficiaries are calculated as follows:

- The LLAFF will fund a minimum of 10 community-led adaptation projects, each expected to benefit approximately 4 communities of approximately 150 people: $10 \times 4 \times 150 = 6,000$ direct beneficiaries. No separate indirect figure is calculated for this output.
- 40 reef-positive businesses are supported, each assumed to employ 5 people: $40 \times 5 = 200$ employees, whose households (average size 5.3) bring the direct beneficiary count to $200 \times 5.3 = 1,060$. Indirect beneficiaries follow from documented per-business multipliers: 50 customers, 5 suppliers, 3 small producers and 3 vendors per business, plus a flat 80-person knowledge-spillover effect and a flat 200-person household-multiplier effect, summing to 2,720.

Double Counting

A project with nine outputs and several thousand square kilometres of overlapping geography inevitably raises the question of whether the same resident is being counted more than once. For the different intervention types, the risk of double counting is addressed by the GIS methodology.

- Where two polygons of the same activity, for example two separate mangrove restoration sites in Ba province, have overlapping 3 km buffers, the buffers are spatially dissolved into one combined shape before the population count is run. The Feasibility Study confirms this explicitly for both the mangrove and living-shoreline modelling: 'for each type of beneficiary, all buffers are spatially treated to exclude any overlaps.' A resident whose home falls within the overlap of two mangrove sites is therefore counted once, not twice.
- Overlap across outputs that explicitly share population is addressed in different outputs.
 - **Outputs 2.1 and 2.3** both report indirect beneficiaries equal to the full population of the four target provinces, because both outputs improve the same GSR governance and ecosystem services for the same residents. The project total indirect figure includes this population once, not twice (it is the same 359,589 people under both outputs).
 - **Output 1.3** does not report a separate indirect beneficiary figure, because the people who would otherwise be counted as indirect beneficiaries of LLAFF-funded community projects are already captured as indirect beneficiaries of Output 2.1's province-wide governance benefit.
 - **Output 2.2** does not report a separate indirect beneficiary figure for the same reason, the planning and decision-making benefit it enables is already captured under Output 2.1.

6. Conclusion

This methodology follows GCF guidance by providing a clear vulnerability context, defining direct and indirect beneficiaries, outlining the assumptions used, and mapping beneficiaries to IRMF adaptation result areas. By applying buffer distances, demographic ratios, business multipliers and training assumptions, we can transparently estimate adaptation benefits and demonstrate

alignment with the GCF's results framework. The table below and accompanying Excel spreadsheet present the detailed calculations that underpin the beneficiary estimates.

Table 2. Interventions and beneficiary numbers

Outputs	Definition of direct and indirect beneficiaries per output	Adaptation benefit	Direct beneficiaries (sex-disaggregated)	Indirect beneficiaries (sex-disaggregated)
Output 1.1: EbA interventions implemented to reduce sedimentation and protect communities from coastal flooding	Direct beneficiaries: These are calculated as the number of people living within 3 km of the EbA interventions. This includes those people near the interventions and downstream who will experience a direct change in flood and sedimentation character because of improved coral and coastal ecosystem functioning. Indirect beneficiaries: These are people living between 3 and 6 km near and downstream from to the EbA intervention locations who will benefit from reduced effects of floods and sedimentation on the direct beneficiaries described above (e.g., this would be the people who would buy food at local markets from fishers who are a subset of the direct beneficiaries described above).	Reduced coastal flooding, erosion, sedimentation	Population within modeled impact zone 77,497 people (39,523 men and 37,974 women)	Population receiving resilience benefits 128,958 people (65,769 men and 63,189 women)
Output 1.2: Green infrastructure developed to reduce flooding and increase the resilience of Fiji's GSR	Direct beneficiaries: These are calculated as the number of people living within 3 km of the green infrastructure intervention locations who will directly experience a change in flood character from the interventions. Indirect beneficiaries: These are people living between 3 and 6 km from the green infrastructure interventions that will benefit from reduced disruption to the direct beneficiaries described above, as well as the co-benefit of infrastructure damage tied to the delivery of key services such as transportation.	Reduced storm surge and coastal flooding	Population within modeled impact zone 35,341 people (18,024 men and 17,317 women)	Population benefiting from reduced service disruption 82,530 people (42,090 men and 40,440 women)
Output 1.3: EbA, green infrastructure, and community capacity development to enhance coral reef ecosystem and community resilience financed through a Locally Led	Direct beneficiaries: These are calculated as the number of people receiving direct benefits from the community led adaptation solutions. This target assumes the average community size is 150 people and that each project would provide benefits to approximately 4 communities. Indirect beneficiaries: Beneficiary calculations for Output 1.3 consider the benefits of Output 2.1, which will	Community adaptation investments	Beneficiaries of funded projects 6,000 people (39,523 men and 37,974 women)	-

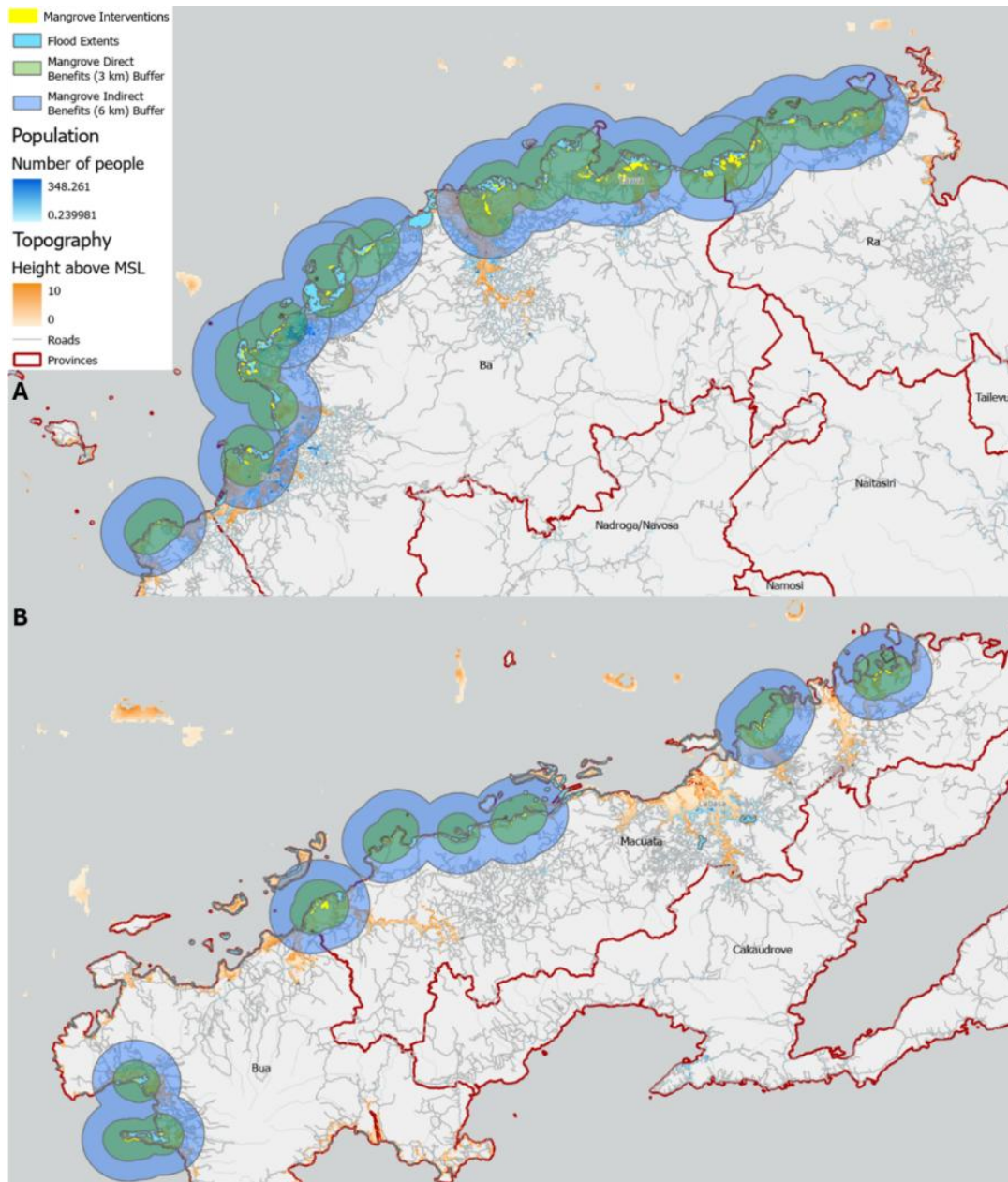
Outputs	Definition of direct and indirect beneficiaries per output	Adaptation benefit	Direct beneficiaries (sex-disaggregated)	Indirect beneficiaries (sex-disaggregated)
Adaptation Fund (LLAF)	benefit from improved ecosystem service as a result of the GSR and its community fisheries being under improved management. As a result, indirect beneficiary numbers have not been included for Output 1.3 to avoid double counting.			
Output 2.1. New management arrangements to reduce climate change vulnerability developed for the GSR.	Direct beneficiaries: These have been calculated estimating the number of government and community participants who will participate in and be responsible for overseeing the execution of the 1-Year GSR Management Plan and FMPs. This assumes that 150 people will be trained in each province annually. We have only included the annual figures as beneficiaries as a majority of these are expected to be reoccurring annual participants and want to avoid double counting. Indirect beneficiaries: The total population of the four project target sites will indirectly benefit from this project output, through the provision of improved ecosystem services from coral reefs resulting from the improved management of the GSR's near-shore fisheries and connected coastal ecosystems.	Capacity building and improved ecosystem management and ecosystem services	Training participants 600 people (163 men and 131 women)	238,231 people (121,497 men and 116,734 women)
Output 2.2: Evidence base to support the adoption of EbA and green infrastructure interventions by GoF	Direct Beneficiaries: The evidence base will be disseminated to national-level stakeholders, provincial line departments, and academic and/or research organizations. These recipients who will directly use the information were calculated as direct beneficiaries. Indirect beneficiaries: Beneficiary calculations for Output 2.2 considers the benefits of Output 2.1, which will generate the economic case for EbA and green infrastructure to inform current and future planning and capacity development. As a result, indirect beneficiary numbers have not been included for Output 2.1 to avoid double counting.	Knowledge products for decision makers	Recipients of knowledge products 100 people	-

Outputs	Definition of direct and indirect beneficiaries per output	Adaptation benefit	Direct beneficiaries (sex-disaggregated)	Indirect beneficiaries (sex-disaggregated)
Output 2.3: Updated procedures for implementing EbA, green infrastructure, and R2R ecosystem planning in Fiji	Direct Beneficiaries: The direct beneficiaries for Output 2.3 include the direct beneficiaries identified for the other project outputs. As a result, direct beneficiary numbers have not been included for Output 2.3 to avoid double counting. Indirect beneficiaries: The total population of the four project target sites will indirectly benefit from this project output, which involves enhancing the regulatory and planning environment for coral reef and integrated coastal ecosystem management in Fiji. The indirect beneficiaries for Output 2.3 include the same indirect beneficiaries identified for Output 2.1. The total number of indirect beneficiaries for this output will therefore also be the total number of indirect beneficiaries. Ba Province: 247,708 people Ra Province: 30,432 people Bua Province: 15,466 people Macuata Province: 65,983 people	Enabling environment improvement for management of the GSR	-	238,231 people (121,497 men and 116,734 women)
Output 3.1: Improved business development support for reef-positive businesses	Direct Beneficiaries: The direct beneficiaries for this output include the businesses supported, their employees and the families of the employees. Given that Output 3.1 targets to support 40 businesses, assuming 5 employees per business and an average household size of 5.3, the number of direct beneficiaries amount to 1,060. Indirect beneficiaries: The estimated indirect beneficiaries of the project include customers, suppliers, small producers, local vendors, and community members impacted by the economic effect. Each of the 40 supported businesses is assumed to serve an average of 50 regular customers, leading to approximately 2,000 indirect beneficiaries. Additionally, each business is estimated to rely on 5 suppliers or service providers, contributing another 200 beneficiaries. Market linkages further extend the impact, as each business is expected to source products from 3 additional small producers, reaching 120 people, and interact with 3 local vendors or retailers, impacting another 120	Technical assistance and funding for reef-positive businesses	Owners and employees of reef-positive enterprises receiving business development support 1,060 people (540 men and 520 women) Indirect: 2,720 people (1387 men and 1333 women)	2,720 people (1,387 men and 1,333 women)

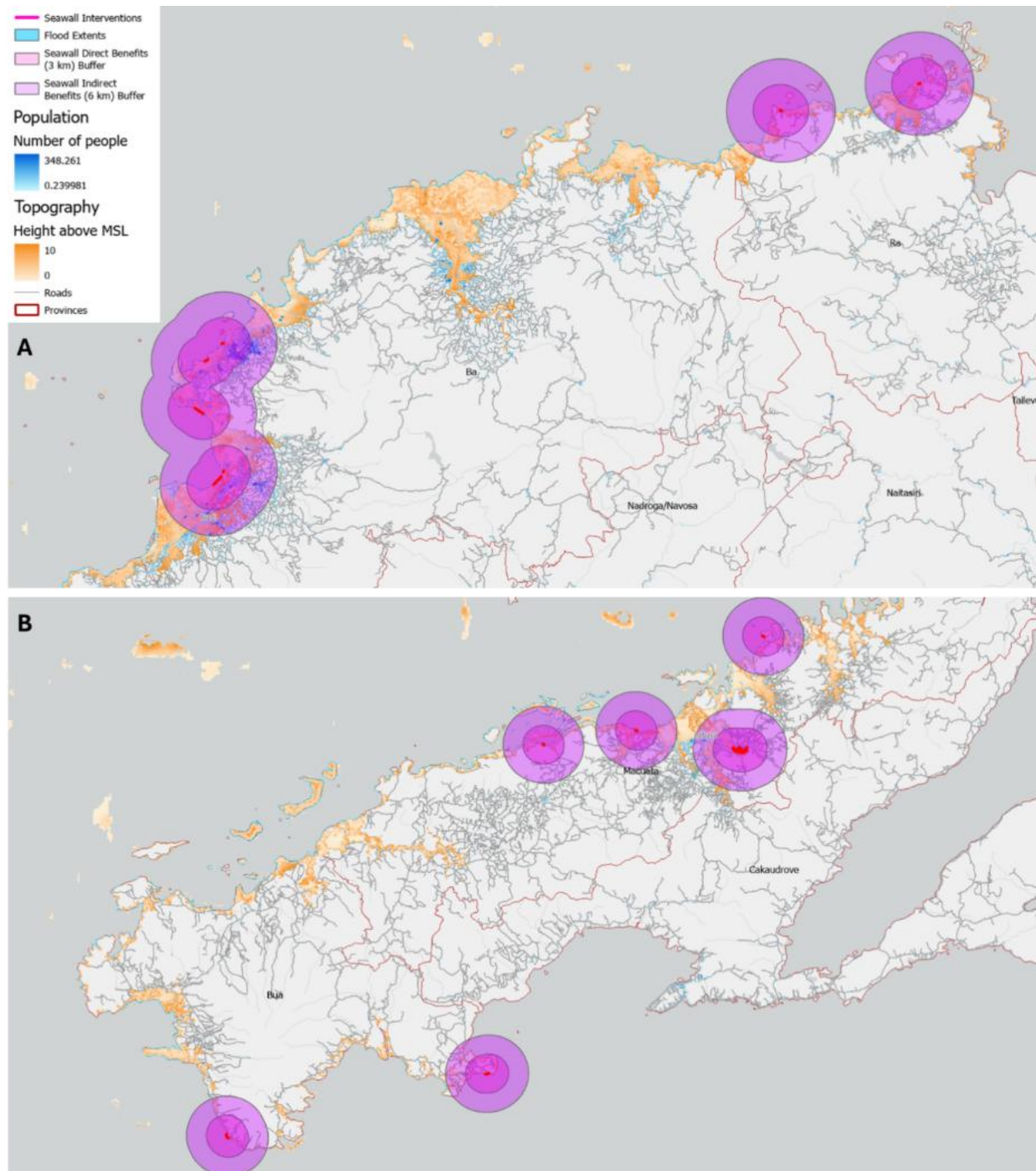
Outputs	Definition of direct and indirect beneficiaries per output	Adaptation benefit	Direct beneficiaries (sex-disaggregated)	Indirect beneficiaries (sex-disaggregated)
	individuals. Knowledge spillover, where supported businesses influence at least 2 other businesses through shared learnings and sectoral growth, is estimated to affect 80 more people. Lastly, the household multiplier effect, where improved business activity increases local spending and benefits small shops and service providers, is estimated at 200 beneficiaries. In total, the indirect beneficiaries are estimated to be around 2,720 people, amplifying the project's impact beyond direct participants.			
Output 3.2: Enhanced coordination, transparency and resources to support reef-positive enterprises	Direct Beneficiaries: The direct beneficiaries of this output include stakeholders who actively participate in multistakeholder working groups, capacity-building sessions, and the development and use of key resources that enhance support for reef-positive enterprises. With 16 working groups held twice a year, and each session engaging around 20 stakeholders, a significant number of participants will directly benefit from improved coordination and collaboration. Additionally, 16 capacity-building sessions will provide targeted learning opportunities for approximately 25 stakeholders per session, strengthening their ability to support reef-positive enterprises. Furthermore, the development of eight key resources, such as assessment frameworks and monitoring tools, will directly benefit financial institutions, business development service providers, and policymakers who rely on these tools to enable access to capital and support sustainable businesses. In total, this output is expected to directly benefit around 760 individuals annually. Indirect beneficiaries: The indirect beneficiaries include those who benefit from improved coordination, knowledge sharing, and resources without directly participating in the sessions or working groups. The strengthened collaboration among stakeholders will lead to better support for reef-positive enterprises, which in turn will benefit others within their networks. Each direct participant is likely to influence at	Enabling environment improvement for reef-positive business markets	Representatives of financial institutions, business development service providers, government agencies, NGOs, and reef-positive enterprises 760 people (387 men and 373 women)	Owners, employees, suppliers, and customers of reef-positive enterprises that benefit from improved coordination, access to finance, business support services, and investment opportunities 1,500 people (765 men and 735 women)

Outputs	Definition of direct and indirect beneficiaries per output	Adaptation benefit	Direct beneficiaries (sex-disaggregated)	Indirect beneficiaries (sex-disaggregated)
	least two additional people within their organizations or communities, extending the impact of the project. Additionally, the improved access to financial resources and business development support will help reef-positive enterprises expand, leading to job creation and economic benefits for local communities. As these businesses grow, they will generate additional opportunities for employees, suppliers, and service providers. Overall, the number of indirect beneficiaries is estimated to be around 1,500 people.			
Total Beneficiaries			121,358 people (61,893 men and 59,465 women)	238,231 people (121,497 men and 116,734 women)

MAPS:



Example Map showing Mangrove Intervention Beneficiary Buffer Zones, Direct (3 Km) Zones in Green and Indirect (6 km) Zones in Blue for Top (A): Viti Levu and Bottom (B): Vanua Levu. Topography in orange shades, population in blue shades and provinces in red outlines. Light Gray Imagery from ArcGIS.



Map of Seawall Impact Buffer Zones for Top (A): Viti Levu and Bottom (B): Vanua Levu. Direct Impacts (3 km) in pink and Indirect Impacts (6 km) in purple. Flood extents in light blue, topography in shades of orange and population in shades of blue. Province outlines are shown in red. Light grey base map from ArcGIS.